Amendments to the Specification

Two paragraphs at page 1, line 16 to page 2, line 18:

In the past, the towers and boats have been most often made of quartz or sometimes of silicon carbide for high-temperature applications. However, quartz and silicon carbide have proven unsatisfactory for many advanced processes. An acceptable yield of advanced integrated circuits depends upon a very low level of particles and metallic contaminants in the processing environment. Often the quartz towers develop excessive particles after a few cycles and must be reconditioned or discarded. Furthermore, many processes require high-temperature processing at above 1000°C or even above 1250°C. Quartz sags at these high temperatures although silicon carbide maintains its strength to a much higher temperature. However, for both materials the high temperature activates the diffusion of impurities from the quartz or silicon carbide into the semiconductor silicon. Some of the problems with silicon carbide have been solved by coating the sintered SiC with a thin SiC surface coating deposited by chemical vapor deposition (CVD), which seals the contaminants in the underlying sintered silicon carbide. This approach, despite its expense, has its own problems. Integrated circuits having features sizes of 0.13μm and below often fail because slip defects develop in the silicon wafer. It is believed that slip develops during initial thermal processing when the silicon wafers are supported on towers of a material having a different thermal expansion than silicon.

Many of these problems have been solved by the use of silicon towers, particularly those made of virgin polysilicon, as described by Boyle et al. in U.S. Patent 6,450,346, incorporated herein by reference in its entirety. A silicon tower 10, illustrated orthographically in FIG. 1, includes three or more silicon legs 12 joined at their ends to two silicon bases 14. Each leg 12 is cut with slots to form inwardly projecting teeth 16 which slope upwards by a few degrees and have horizontal support surfaces 18 formed near their inner tips 20. A plurality of wafers 22, only one of which is illustrated, are supported on the support surfaces 18 in parallel horizontal orientation along the axis of the tower 10. For very high-temperature processing, it is preferred

that there be four legs 12 and that the support surfaces 18 be arranged in a square pattern at 0.707 of the wafer radius from the center. A boat has much the same structure but with both bases configured on one side to support the ~~horizontal~~ horizontally arranged boat. The wafers are supported a few degrees from vertical both at the bottom of the slots and the tips of the teeth.

Paragraph at page 4, lines 1-13:

Two silicon members to be joined are separated by a gap having a thickness of about 50μm (2 mils). The thickness of the gap represents an average separation of the leg 12 and the base 14 as the end 26 of the leg 12 is at least slidably fit in the mortise hole 24. The gap thickness cannot easily be further reduced because of the machining required to form the complex shapes and because some looseness of assembled members is needed to allow precise alignment of the support surfaces and other parts. A coating of the liquid SOG precursor or the SOG/silicon-powder mixture is applied to at least one of the mating surfaces before the two members 12, 14 are assembled such that the SOG precursor with optional silicon powder fills the gap 34 of FIG. 3. Following curing and a vitrification anneal at a temperature typically above 600°C, the SOG precursor with optional silicon powder changes into a solid having the structure of a silicate glass in a three-dimensional network of silicon and oxygen atoms and their bonds and optionally forming a matrix for the larger fraction of the embedded silicon crystallites.

Paragraph at page 9, lines 16-24:

In one embodiment, the liquid SOG precursor or the slurry of SOG and silicon powder is applied prior to assembly to one or both of the parts to be joined to form, as illustrated in the cross-sectional view of FIG. 5, an adhesive region 40 between the assembled parts. After assembly, an alignment jib aligns the tower to the tolerances of about 25 to 50μm required for wafer support towers. After the tower has been aligned, the tower and jig are moved to an annealing furnace to cure the SOG in the adhesive region 40 at temperatures of up to about 1300°C . Other adhesives and curing processes may be substituted if the adhesive is properly sealed by the plasma sprayed silicon. Alternatively, the tower is aligned to a jig inside the cooled

furnace, and thereafter the furnace is raised to the required annealing temperature.

Paragraph at page 10, lines 10-21:

In a second embodiment of the invention, the adhesive is applied to the areas to be joined, and the tower is assembled and jigged. However, prior to the adhesive anneal with the tower still aligned in the jig, as illustrated in the cross-sectional view of FIG. 8, a small tack 48 of silicon is plasma sprayed into a small angular portion of the chamfer 34. The tack 48 operates similarly to a tack or spot weld in forming a small-area contact between the base 32 and leg 36 to temporarily bond the two together. A plasma-sprayed tack similarly joins each end of each leg 36 to its respective base 32. The tacks 48 provide sufficient mechanical strength to keep the tower in alignment after removal from the jig if care is taken to not shock the tower. The unjigged but joined tower is moved to the annealing furnace for the adhesive anneal. The tower is then removed from the furnace, its joints are masked, and the silicon layer 44, illustrated in the cross-sectional view of FIG. 8, is plasma sprayed to completely fill the chamfer 34. This embodiment eliminates the need to jig the tower inside the annealing furnace.

Three paragraphs at page 10, line 29 to page 11, line 23:

Plasma spraying may be used with a through mortise hole to provide a strong joint without the need for an adhesive. As illustrated in the cross-section view of FIG. 10, a through mortise hole 50 is bored through the silicon base 32. Upper and lower chamfers 52, 54 are machined into the base at the opposed ends of the mortise hole 50. As illustrated in FIG. 11, the silicon leg 36 [[34]] is inserted through the mortise hole 50 with a gap 56 being left between the leg 36 [[34]] and the base 50. The axial position of an axial face 58 of the leg 36 [[34]] should be near a planar bottom surface 60 of the base 50, but may be somewhat above or below it. The final position, whether above or below, may depend upon the final alignment. As illustrated in FIG. 12, a silicon collar 64 is plasma sprayed on one side of the base 32 to fill the upper chamfer 52 and to bond the base 32 to the sides of the leg 36 [[34]]. A silicon cap 66 is plasma sprayed on the other side of the base to cover the axial face 58 and side portions of the leg 36 [[34]], to

fill the lower chamfer 54, and planar portions of the bottom surface 60 of the base 32.

The two plasma sprayed layers 64, 66 bond portions of the leg 36 [[34]] at opposite ends of the mortise hole 50, thereby providing a strong joint without the need for any adhesive. However, if desired, adhesive may be applied to the parts prior to assembly to fill the gap 56. The additional adhesive is particularly useful if the structure is to be used inside a vacuum chamber to prevent a virtual leak through the plasma sprayed silicon, which may be somewhat porous.

If desired, further machining smooths the surfaces, as illustrated in FIG. 13. The collar 64 may be ground to form a shaped collar 82 barely protruding above the chamfer 52. The silicon cap 66 and possibly the end of the leg 36 [[34]] may be ground smooth to form a bottom collar 80. If the bottom leg face 58 of FIG. 12 is recessed in back of the bottom base surface 60, then after grinding a portion of the silicon cap 66 extends across the center of the bottom collar 80. The smooth bottom surface is especially desirable on the lower base to provide a smooth support surface.

Paragraph at page 12, lines 12-24:

The invention allows the easy fabrication of large silicon rings from a number of much smaller silicon segments bonded together in a circle. A singly chamfered segment 100 is illustrated orthographically in FIG. 15. It is a generally rectangular member having a top surface 102 and an unillustrated ~~unillstrated~~ parallel bottom surface, an [[a]] inner surface 104 and an unillustrated parallel bottom surface, and [[and]] perpendicular thereto an inner surface 104 and an unillustrated back surface. However, the member has a first flat end surface 106 and a second flat end surface 108 which are offset from each other with respect to a ring radius and at least one of which is non-perpendicular to the front surface 104. The amount of angular offset depends upon the number *N* of such segments 100 used to form the ring. In general, the offset is 360°/N. Further, a first upper chamfer 110 is machined between the first end surface 106 and the top surface 102 and a yet unillustrated first bottom chamfer is machined between the first end surface 106 and the bottom surface. Similarly, a second upper chamfer 112 and as yet unillustrated

second bottom chamfer are cut at the other axial end of the segment 100 adjacent the second end surface 108.

Paragraph at page 14, lines 4-19:

Similar techniques can be used to form large tubular bodies, such as furnace and reactor liners and reactor vacuum chamber walls by the use of barrel staves. Boyle et al. describe the stave technique in the aforementioned patent, but using SOG adhesive as the primary bonding agent. A stave 130 illustrated in axial cross-section in FIG. 22 is machined to be shaped as a generally truncated wedge extending a substantial distance perpendicular to the plane of the illustration. The stave 130 has an inner face 132 and a parallel outer face 134. First and second side faces 136, 138 are offset from each other and at least one of them is not perpendicular to the inner and outer faces 132, 134. Inner chamfers 140, 142 are machined between the inner face 132 and the respective side face 136, 138. Similarly outer chamfers 144, 146 are machined between the outer face 134 and the respective side face 136, 138. Optionally to facilitate alignment, a tongue <u>143</u> [[142]] is machined in the first side face 136 and a corresponding groove 144 is machined in the second side face 138. All these features preferably extend axially along the substantial axial length of the stave 130, which corresponds to the length of the final tube. The chamfers 140, 142 of the stave 130 corresponds to the chamfers 116, 118 of the doubly chamfered segment 114 of FIG. 16, and the stave 130 has much less need for the segment's chamfers 110, 112.

Paragraph at page 15, line 23 to page 16, line 8:

By use of plasma spraying, the crack 160 can be repaired, and the tower or other structure can be returned to service. The same technique may be used to repair chips. As illustrated in FIG. 29, the member 162 is machined in the area of the crack 160 to form a more regular hole 168 with a more open aspect ratio, preferably with sloping sides. A milling machine or a drill can be used for the machining. Alternatively, a Dremel tool can be manually operated to perform the limited amount of machining required. As illustrated in the orthographic view of FIG. 30,

silicon is plasma sprayed on both of the faces 164, 166 to form a continuous silicon layer 170 that fills the machined hole 168 and extends above the original surfaces surrounding the hole 168. If desired, as illustrated in FIG. 31, both faces 164, 166 may be ground smooth to restrict the silicon layer 170 to the volume of machined hole 168 to form a planarized silicon layer 172 with perpendicular faces flush with the two member faces 164, 166. The same general procedure is followed if the crack 160 appears in only one face of the silicon members with the processing limited to that face. If the crack 160 is not too close to other members of the assembled structure, the repair can be performed without disassembling the structure. Further, there may be situations when an unassembled silicon member requires crack repair.